GATES LEARJET CORPORATION

maintenance manual

CHAPTER

33

LIGHTS

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*33-List of Effective Pages	1	Jul 16/84
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GENERAL - DESCRIPTION AND OPERATION

1. General
 A. The lighting circuits and related components presented in this chapter are to be used in conjunction with the wiring diagrams and electrical control schematics.
 B. The aircraft lighting is divided into four major systems: flight compartment lights, passenger compartment lights, exterior lights and emergency lights.
 C. Flight compartment lighting consists of instrument panel lights, flood lights and map lights.
 D. Passenger compartment lighting consists of general lighting in the upper center panel and individual lights throughout the cabin.
 E. Exterior lighting consists of the landing and taxi lights, navigation lights, anti-collision lights, strobe lights and a recognition light.
 F. General trouble shooting procedures are provided in this section only because most light circuits require the same basic steps to locate the trouble. In most cases, inoperative lamps, open circuit breakers, blown fuses and such troubles are obvious.

GENERAL - TROUBLE SHOOTING

1. General
 A. The following trouble shooting steps are provided to augment specific circuit information found in the wiring diagrams, and to serve as a basis for developing the more detailed procedures required to locate the cause of infrequent light system troubles.

2. Tools and Equipment

NAME	PART NUMBER	MANUFACTURER	USE
Voltmeter	260 or	Simpson	Continuity Checks
Voltmeter	3430A	Hewlett Packard	Continuity Checks

3. Trouble Shooting
 A. When possible, investigate report of trouble at source to ascertain conditions leading to trouble, conditions under which trouble occurred and whether other failure of other lighted circuits or electrical systems occurred simultaneously. Careful analysis of such information is often indicative of nature and location of trouble.
 B. Study circuit wiring diagrams covering affected light system and its related power supply. A thorough understanding of the function is necessary before a trouble shooting procedure can be effectively planned and executed. By combining a knowledge of applicable circuits with information gained from trouble report, an investigation usually indicates circuit, or section of circuit, in which trouble is located.
 C. Visually inspect circuit for open circuit breakers, blown fuses, broken wiring, loose wire connections, loose electrical connectors, and evidence of shorting. Observe particularly, security of connections and presence of foreign matter.
 D. Perform continuity check. A blown fuse, burned wires, or other evidence of shorting indicates that a power-on check would create a hazardous condition. With power off, isolate defective circuit and check one section at a time until shorted or open circuit section is found.
 E. Perform power-on check only when it has been determined that such a check cannot create a hazardous condition. With power on, perform operational tests to confirm report of trouble and to determine, if possible, whether cause of trouble is in light circuit or in power supply system. A voltmeter or test light may also be used for a power check at various breakpoints in circuit, such as terminal strips and equipment input terminals, to determine if power is available at these points.

F. Replace any light assembly or component that remains inoperative after making certain that power is available at unit and that ground connections are secure at unit.

GENERAL - MAINTENANCE PRACTICES

1. General

A. The lighting circuits require minor maintenance such as lamp or switch replacement. The lighting components are readily accessible and can be maintained without use of special tools.

B. When defective lamps, light assemblies or components are replaced, equipment with identical part numbers should be installed, unless authorized substitutes are available.

LOCATION	PART NUMBER/VENDOR
INTERIOR	
GLARESHIELD	
FIRE	327 G.E.
ARMED	327 G.E.
SHUTOFF VALVE	62 SHELLY
INSTRUMENT PANEL FLOOD	313 G.E.
ICE DETECTOR	62 SHELLY
READOUT PANEL LIGHTS	327 G.E.
SWITCH PANEL	
LANDING GEAR - UNSAFE	62 SHELLY
LANDING GEAR - LOCKED DOWN	62 SHELLY
AIR IGNITION	62 SHELLY
PILOT PANEL - ANTI-SKID GEN.	62 SHELLY
FUEL CONTROL PANEL	
CROSSFLOW VALVE	62 SHELLY
FUSELAGE TANK EMPTY	62 SHELLY
FUSELAGE TANK	62 SHELLY
TRANSFER VALVE	62 SHELLY
JET PUMP	62 SHELLY
MISCELLANEOUS	
UTILITY LIGHT TAILCONE	313 G.E.
READING	1495 G.E.
ENTRY OR COURTESY	305 or 307 G.E.
MAP	1495 G.E.
EDGE LIGHT	715 G.E.
POST LIGHTS	328 (5V), 327 (28V) G.E.
BAGGAGE	305 G.E.
NO SMOKING AND FASTEN SEAT BELT	305 G.E. or 62 SHELLY
OVERHEAD CENTER PANEL	307 G.E.
EXTERIOR	
AFT BULLET	1683 G.E.
LOWER ANTI-COLLISION BEACON	A7079B-24 GRIMES
LANDING LIGHT	4580 G.E.
NAVIGATION TAIL LIGHT	1683 G.E.
NAVIGATION LIGHT WING TIP	A7512-24 GRIMES
UPPER ANTI-COLLISION BEACON	A7079B-24 GRIMES
RECOGNITION LIGHT (IF INSTALLED)	4552 G.E. or Q4559 G.E.

Note

Replacement with equivalent light bulbs is approved as long as voltage and amperage rating is the same.

Light Bulb Replacement
Figure 201

FLIGHT COMPARTMENT LIGHTS - DESCRIPTION AND OPERATION

1. General
 A. The flight compartment lights provide general and local lighting for the area, for control panels, instruments and controls.
 B. Most instruments are integrally lighted and the instruments and panel lights are dimmed by controls located on either side of the cockpit. The lights are operated by 5 vdc.
 C. The flood light is controlled by a rheostat switch on the pilot's side of the cockpit. The cockpit floodlight may be used as instrument lighting.
 D. The glareshield warning light panel lights provide visual indications of a systems operating condition.
 E. Map lights are provided for each crew member. The lights are installed in the headliner above each crew member.

MAP LIGHT - MAINTENANCE PRACTICES

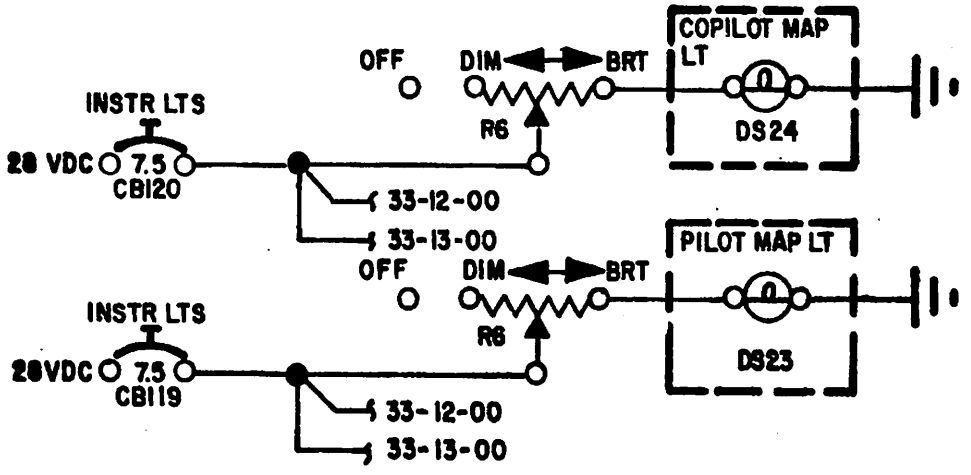
1. General
 A. The map reading lights, located on the left side of the pilot and the right side of the copilot, are controlled by a rheostat-type switch adjacent to the lights.
 B. The lights are powered by 28 vdc thru their respective INSTR LT circuit breaker. The map lights also serve to illuminate the circuit breaker panels.
 C. To remove the bulb from light assembly depress and turn bulb. Refer to 33-00-00 for bulb replacement chart.

2. Removal/Installation
 A. Remove Map Light

 NOTE: Removal and Installation instructions are identical for both map lights.

 (1) Remove upholstery from side panel.
 (2) Remove attaching parts and remove light assembly sufficiently to gain access to wiring.
 (3) Disconnect wiring from light assembly.

 B. Install Map Light
 (1) Connect electrical wiring to light assembly.
 (2) Install light assembly and secure with attaching parts.
 (3) Install upholstery.

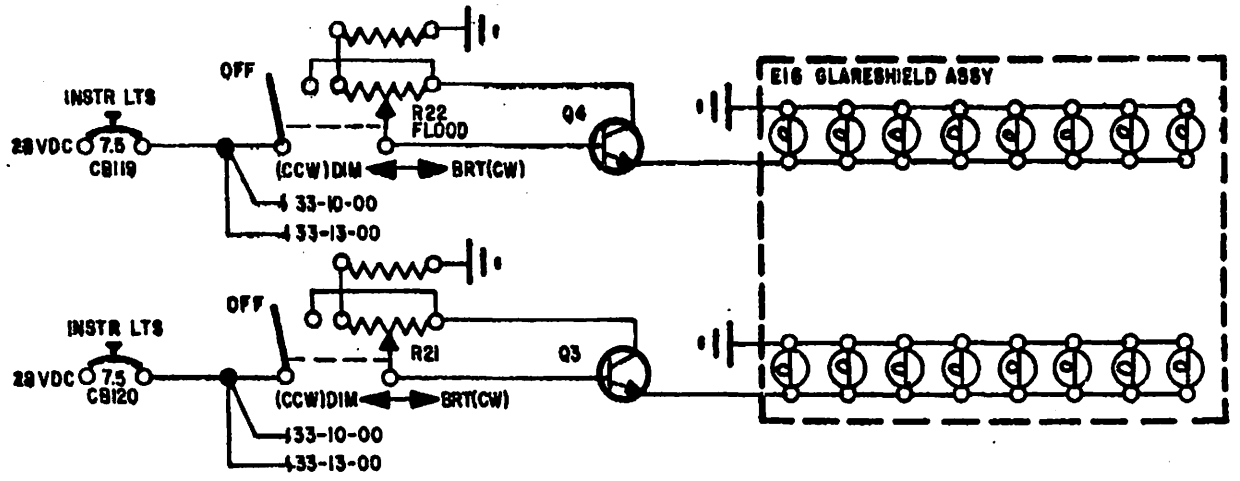


Map Light Electrical Control Schematic
Figure 201

FLOOD LIGHTS - MAINTENANCE PRACTICES

1. General
 A. The pilot's and copilot's flood lights are individually controlled by separate on-off rheostat-type switches. The pilot's switch is located on the cockpit left side immediately aft of the pilot's subpanel. The copilot's switch is located on the cockpit right side. The flood lights are powered through the INSTR LT circuit breakers.

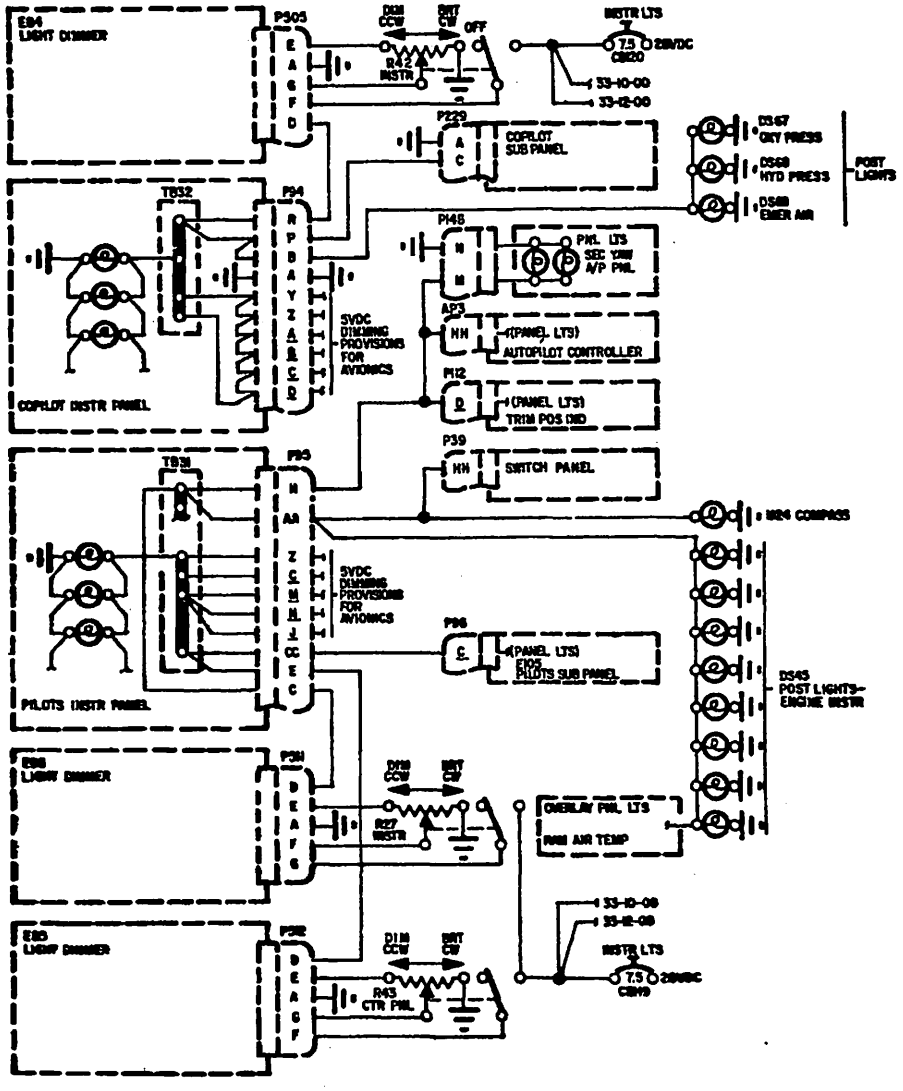
2. Removal/Installation
 A. Bulb Replacement
 (1) Remove the two screws on top of the glareshield which secure the flood light lens retainer.
 (2) Remove lens retainer and lens.
 (3) Depress bulb and rotate counterclockwise to remove.
 (4) Install new bulb, depress and rotate clockwise.
 (5) Install lens and lens retainer and secure with attaching parts.



Flood Light Electrical Control Schematic
Figure 201

INSTRUMENT PANEL LIGHTING - MAINTENANCE PRACTICES

1. General
 A. 5 vdc instrument lighting is provided by light dimmer assemblies. The output of the light dimmer assemblies is connected to a terminal board, one located on the pilot's instrument panel and one on the co-pilot's instrument panel.
 B. The terminal boards are the primary connecting point for the various control panel, avionics equipment and post lights which utilize the 5 vdc lighting.
 C. The terminal boards are secured to instrument panel structure behind the instruments.



Instrument Panel Lighting Electrical Control Schematic
Figure 1

LIGHT DIMMER ASSEMBLY - MAINTENANCE PRACTICES

1. General

A. The light dimmer assemblies are installed in the nose compartment. The light dimmer assemblies reduce a portion of the 28 vdc to 5 vdc which is used to power various instrument lights. The light dimmer assemblies are powered through the INSTR LTS circuit breakers. The light dimmer assemblies incorporate exterior-mounted fuses.

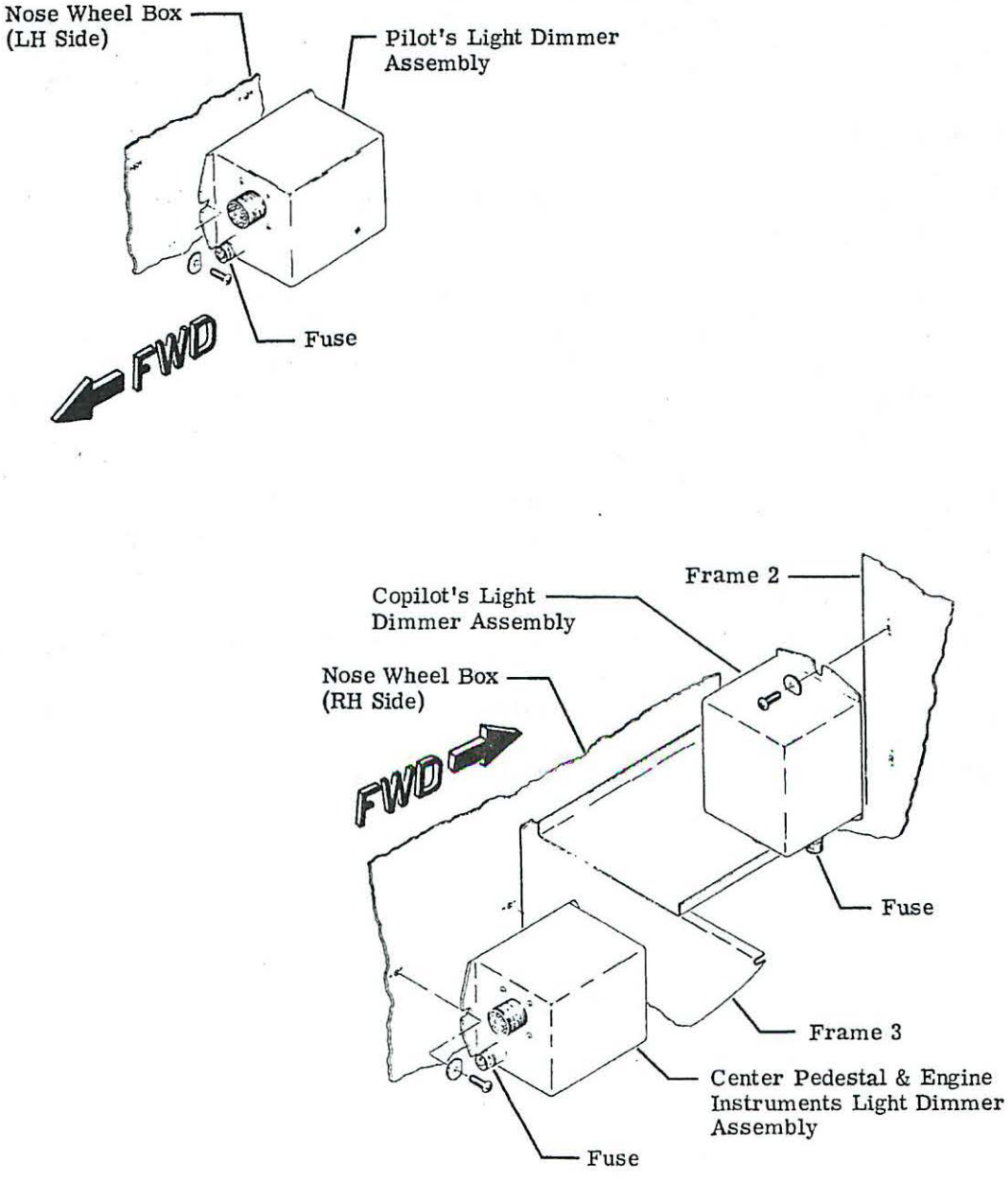
2. Removal/Installation

NOTE: The following procedures are applicable for any of the light dimmer assemblies.

The copilot's light dimmer assembly is located on the right side of the nose wheel box aft of frame 2. The pilot's light dimmer assembly is located on the left side of the nose wheel box aft of frame 3. The pedestal and center panel light dimmer assembly is located on the right side of the nose wheel box aft of frame 3.

A. Remove Light Dimmer Assembly (See figure 201)
 (1) Remove avionics equipment and racks as required to gain access to light dimmer assembly.
 (2) Disconnect electrical plug.
 (3) Remove attaching parts and light dimmer assembly from aircraft.

B. Install Light Dimmer Assembly (See figure 201)
 (1) Install light dimmer assembly and secure with attaching parts.
 (2) Connect electrical plug.
 (3) Install racks and avionics equipment previously removed.



Light Dimmer Assembly Installation
Figure 201

PASSENGER COMPARTMENT LIGHTING - DESCRIPTION AND OPERATION

1. General
 A. Passenger compartment lighting consists of individual passenger lighting, general cabin lighting, entry lighting and no smoking and fasten seat belt lighting.

2. Description
 A. Individual passenger lights are installed in the close out panel between the upper center panel and the windows. The lights are operated by a switch adjacent to each light and powered by 28 vdc through the ENTRY LT circuit breaker.
 B. The cabin entry lights include a light in the LH service cabinet, the upper center panel lights and the baggage compartment. The service cabinet light, the upper center panel lights and the aft baggage compartment lights are all controlled by a switch located in the LH service cabinet. The aft upper center panel light is controlled by a switch adjacent to the light. All the entry lights are powered by 28 vdc through the ENTRY LT circuit breaker, except for the aft upper center panel light which is powered through the CABIN LT circuit breaker.
 C. The no smoking and fasten seat belt lights are located in the LH service cabinet. On 25-108 and Subsequent, the light is located in the forward part of the upper center panel. The lights are controlled by a switch located on the pedestal switch panel and are powered through the CABIN LT circuit breaker. The control switch also provides power to the tone generator system. (Refer to 23-30-00 for further information.)

PASSENGER COMPARTMENT LIGHTING - MAINTENANCE PRACTICES

1. Cleaning/Painting

NOTE: The following procedures are applicable to aircraft which incorporate cold cathode lighting.

A. Cold cathode lamps contain small amounts of liquid mercury. Should a lamp be broken in the aircraft, the mercury will flow to its lowest possible level. Mercury will cause deterioration of metal surfaces, including the aircraft skin. Therefore it is extremely important that the following cleaning procedure be followed if a lamp is broken.

B. Tools and Equipment

NAME	MANUFACTURER	USE
Sublimed Sulfur (Flowers of Sulfur)	Commercially Available	Binds with mercury to break it away from metal.
Vacuum Sweeper	Commercially Available	Pick up mercury and sulfur.

C. Remove Mercury Traces from Aircraft

(1) Remove upholstery, seats, and equipment, as required, in the area of a broken lamp.

(2) Locate areas of mercury concentration by sprinkling sublimed sulfur onto suspected areas.

NOTE: The mercury has a tendency to collect in low-lying areas such as along seat rails, stringers, or edges of frames. There is approximately 200 mg of mercury in each cold cathode lamp. Since this is an extremely minute amount, diligent searching is required to locate the mercury.

(3) Ensure that vacuum sweeper is empty of dirt and trash.

(4) Vacuum up sublimed sulfur along with mercury.

(5) Check upholstery, seats, and equipment to ensure there are no traces of mercury present.

(6) Install upholstery, seats, and equipment removed in step (1).

(7) Empty vacuum sweeper. This will prevent a possible chemical reaction the mercury may have with other contents.

EXTERIOR LIGHTING - DESCRIPTION AND OPERATION

1. General
 A. The aircraft exterior lighting systems consist of a combination landing and taxi light, navigation lights, anti-collision lights, a recognition light, high-intensity strobe lights and an optional wing inspection light.

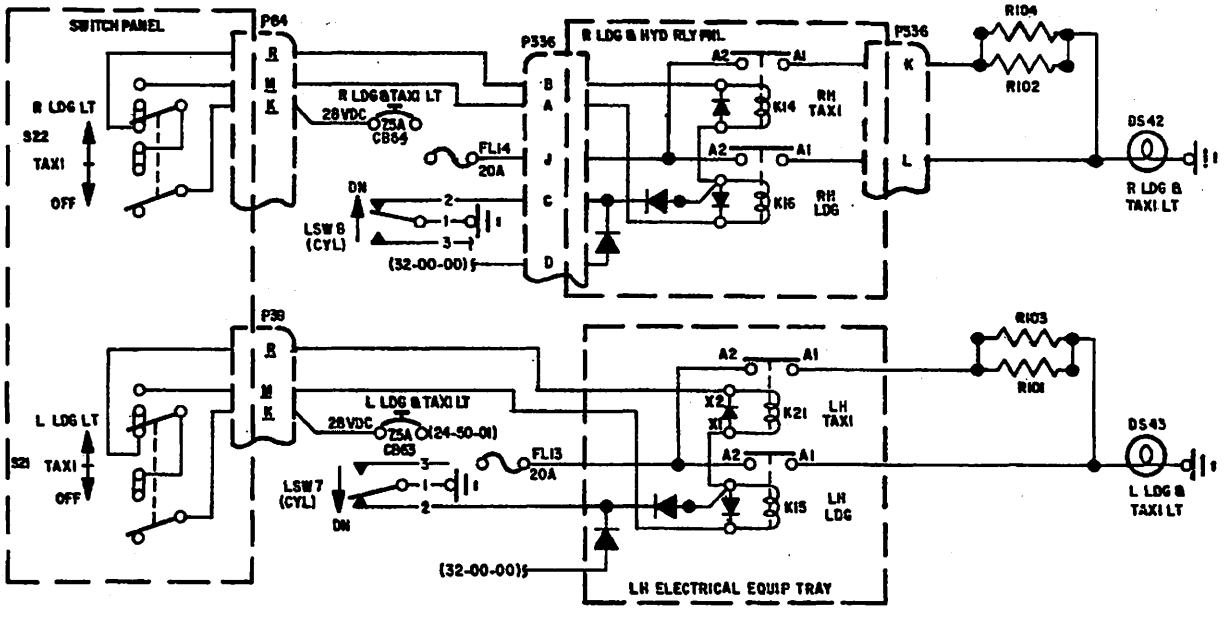
LANDING AND TAXI LIGHTS - MAINTENANCE PRACTICES

1. General
 A. A 450-watt landing light is installed on each main landing gear. The landing lights also serve as a taxi light.
 B. Each light is controlled by its respective LDG-TAXI-OFF switch located on the Switch panel. The landing light circuits are wired through the main landing gear down-and-locked switches (main gear actuator); therefore, the landing lights are inoperative with the gear retracted.

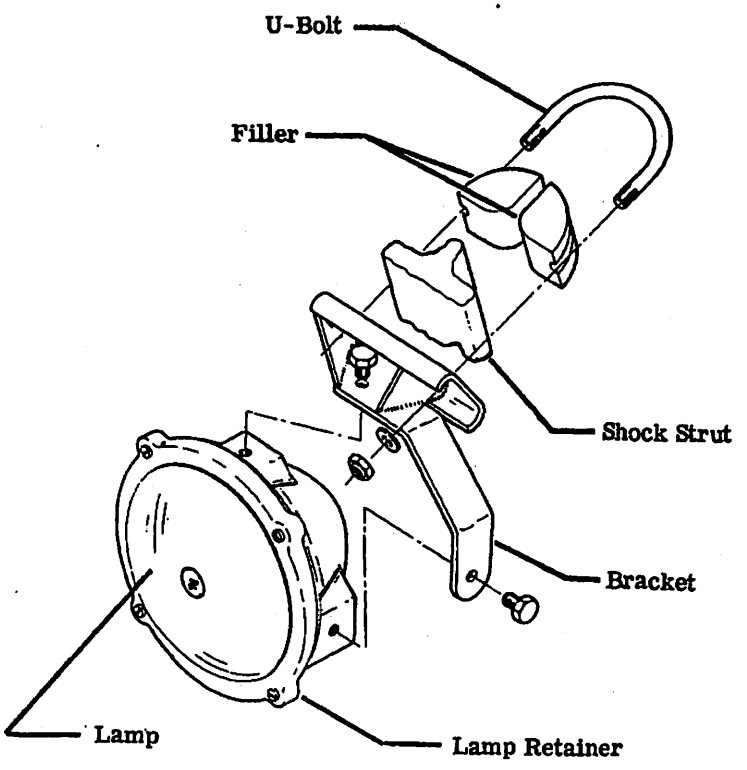
2. Removal/Installation

 NOTE: The following removal and installation procedures are identical for both light installations.

 A. Remove Landing and Taxi Lights (See figure 202)
 (1) Remove attaching parts and lens retainer lamp fixture.
 (2) Remove defective lamp.
 B. Install Landing and Taxi Lights (See figure 202)
 (1) Install lamp in lamp fixture, assuring that filament is in a vertical position.
 (2) Check lamp retainer for condition of asbestos tape. If defective, replace asbestos tape.
 (3) Install retainer and secure with attaching parts.



Landing and Taxi Light Electrical Control Schematic
Figure 201



Landing and Taxi Light Installation
Figure 202

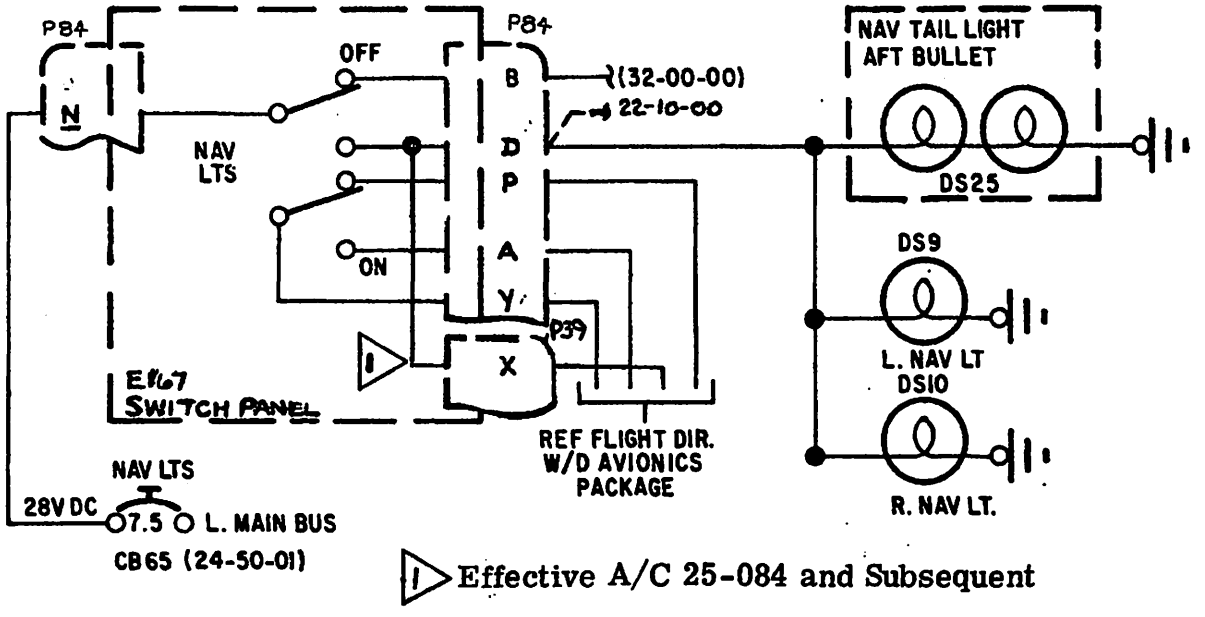
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NAVIGATION LIGHTS - MAINTENANCE PRACTICES

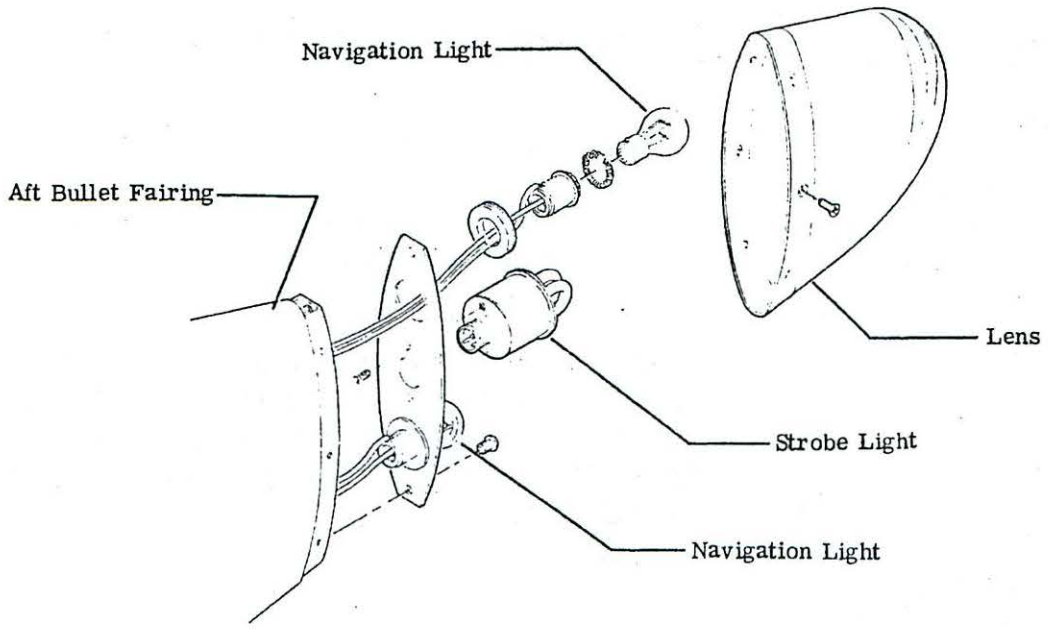
1. General
 A. The navigation lights are located on the outboard side of each tip tank and in the aft bullet fairing.
 B. The lights are controlled by the NAV LT Switch located on the switch panel. Access to the navigation light bulb for replacement is gained by removing the screws which retain the lens.

 CAUTION: DO NOT LEAVE NAVIGATION LIGHTS ON FOR EXTENDED PERIODS OF TIME WHILE THE AIRCRAFT IS IN THE HANGAR. WITHOUT COOLING AIR THE TAIL NAVIGATION LIGHT MAY GENERATE ENOUGH HEAT TO DISTORT THE LENS.

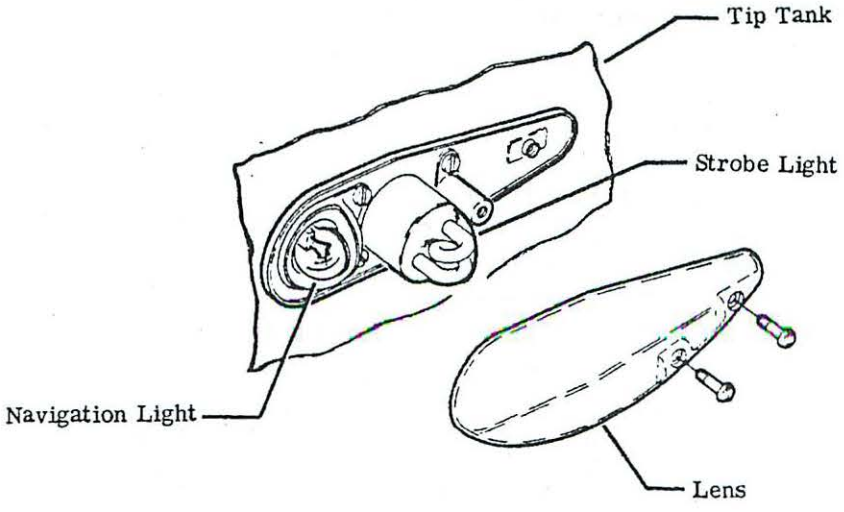
2. Light Bulb Replacement
 A. Bulb Removal
 (1) Remove attaching parts and lens from applicable navigation light installation.
 (2) Remove defective bulb.
 B. Bulb Installation
 (1) Install new bulb.
 (2) Install lens and secure with attaching parts.



Navigation Lights Electrical Control Schematic
Figure 201



AFT BULLET FAIRING INSTALLATION



TIP TANK INSTALLATION (TYPICAL)

Navigation Light Installation
Figure 202

ANTI-COLLISION LIGHT - MAINTENANCE PRACTICES

1. General

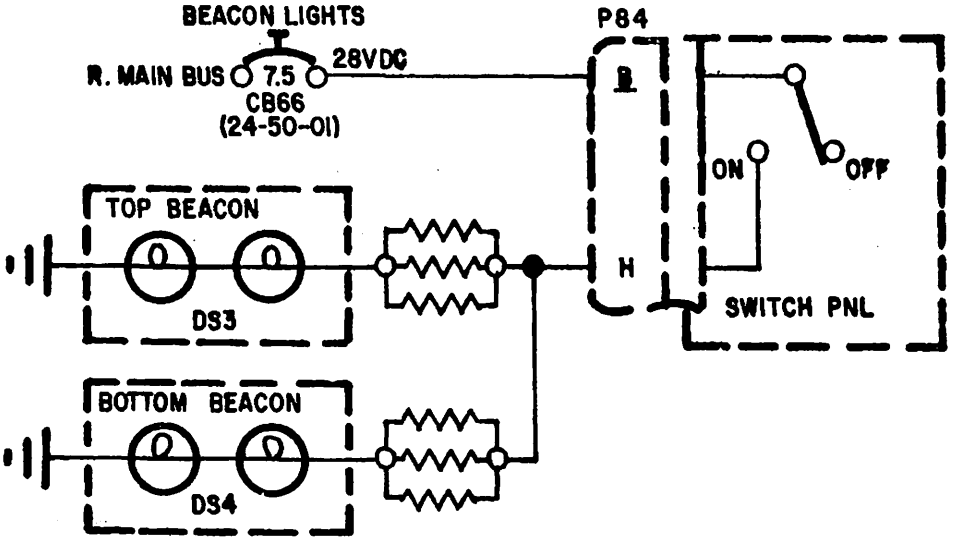
A. A dual bulb anti-collision light assembly is mounted on top of the vertical stabilizer and on the bottom of the fuselage. The bulbs oscillate approximately 180° at 45 cycles per minute. The beam is concentrated by an integral lens in the bulb that produces an illusion of 90 "flashes" per minute due to the oscillations. The lights are controlled by the BCN LTS Switch on the Switch Panel. Access to the bulbs for replacement is gained by removing the screws and retainer which secure the lens.

2. Removal/Installation

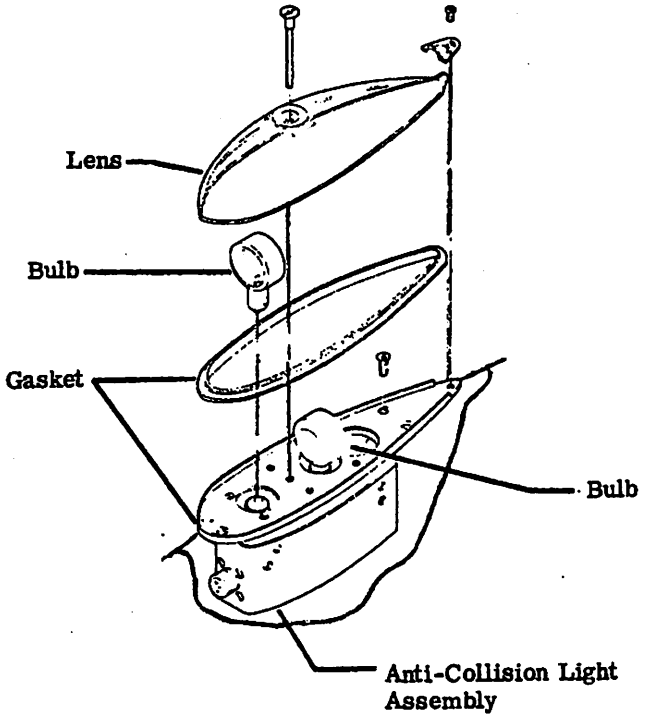
NOTE: The following removal and installation procedures are identical for both anti-collision lights.

A. Remove Anti-Collision Bulb (See figure 202)
 (1) Remove attaching parts, gasket and lens from anti-collision light assembly.
 (2) Remove defective bulb.

B. Install Anti-Collision Bulb (See figure 202)
 (1) Install new bulb.
 (2) Inspect gasket and replace if required.
 (3) Install gasket, lens and secure with attaching parts.



Anti-Collision Light Electrical Control Schematic
Figure 201



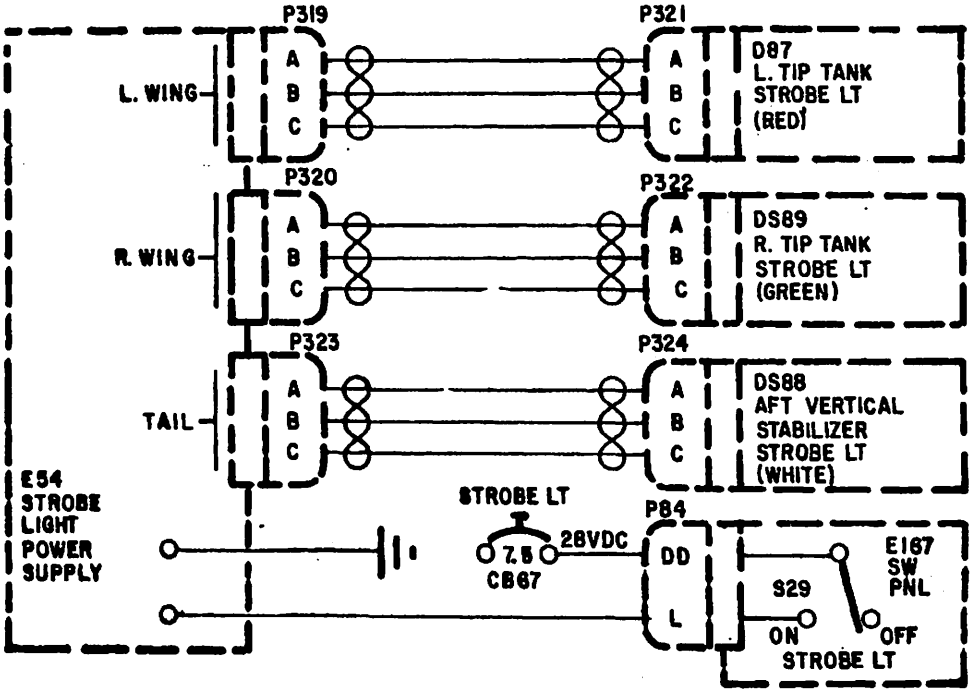
TYPICAL

Anti-Collision Light Installation
Figure 202

STROBE LIGHT - MAINTENANCE PRACTICES

1. General
 A. The strobe light system consists of three power supply modules, a timing circuit module, three strobe light assemblies, a strobe light switch, and circuit breaker. The strobe lights, mounted adjacent to each navigation light, may be operated independently of the navigation lights. The timing circuit provides a pulse of approximately 50 times a minute to each of the strobe power supply modules. The modules furnish 450 vdc to operate its applicable strobe light. Each module is protected by an internally mounted 3 amp fuse. The strobe lights are controlled by the STROBE LT Switch on the Switch Panel.

2. Removal/Installation
 A. Remove Strobe Light Bulb
 (1) Remove attaching parts and lens from strobe light installation.
 (2) Remove defective strobe light bulb.
 B. Install Strobe Light Bulb
 (1) Install new strobe light bulb.
 (2) Install lens and secure with attaching parts.
 C. Remove Strobe Light Power Supply (See figure 202)
 (1) Lower tailcone access door and disconnect aircraft batteries.
 (2) Disconnect electrical plug from power supply unit.



Strobe Light Electrical Control Schematic
Figure 201

(3) All electrical connections between the power supply unit and the base are completed when the power supply unit is installed and secured in place. When removing power supply unit from base, lift unit straight up from base. This will prevent damage to connector. Remove holddown screws and power supply unit from aircraft.

(4) If base is to be removed, disconnect electrical plug, remove attaching parts and base from aircraft.

D. Install Strobe Light Power Supply (See figure 202)

(1) Install base and secure with attaching parts. Connect electrical plug.

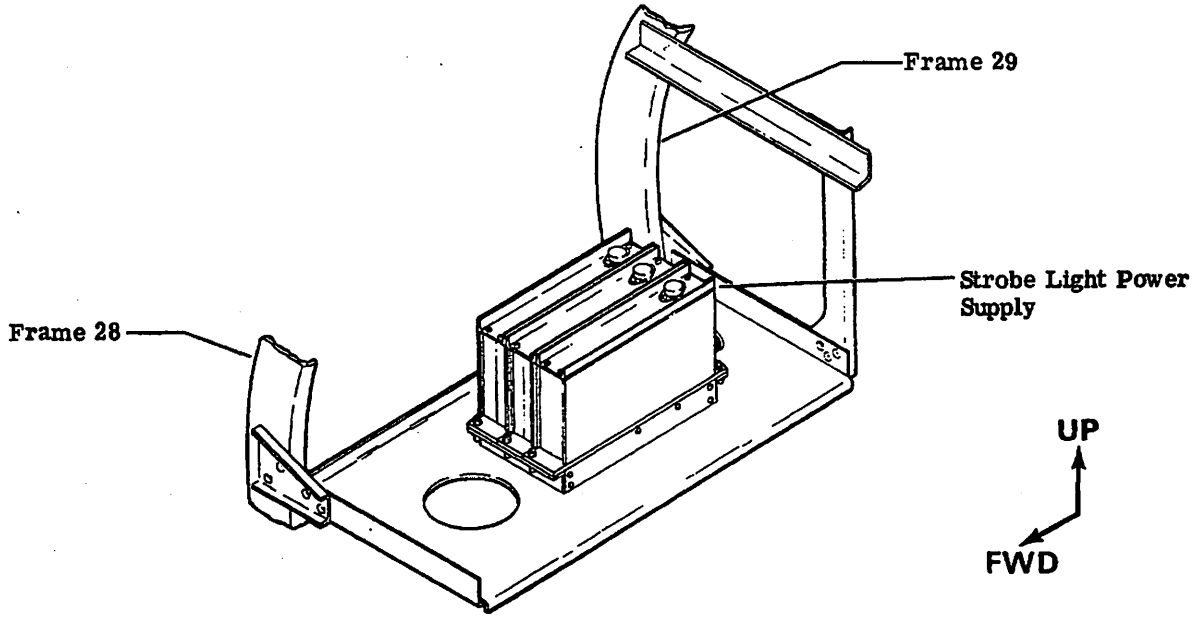
(2) Place power supply unit on base and press down until unit is firmly in place. Secure power supply unit with holddown screws.

(3) Connect electrical plug to power supply unit.

(4) Connect aircraft batteries.

(5) Perform operational check of strobe lights.

(6) Secure tailcone access door.

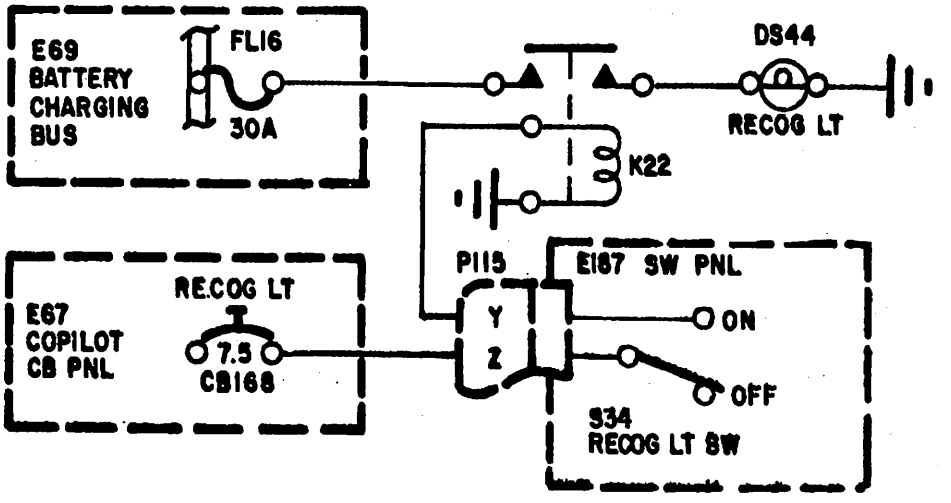


Strobe Light Power Supply Installation
Figure 202

RECOGNITION LIGHT - MAINTENANCE PRACTICES

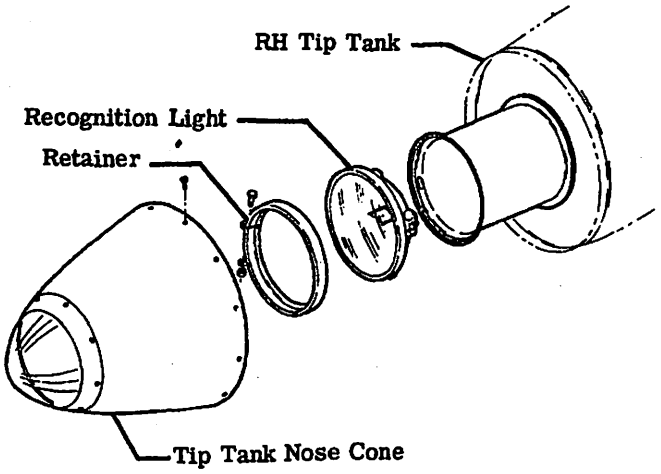
1. General
 A. The recognition light system consists of a 250-watt lamp located in the RH tip tank nose cap, a control relay located in the tailcone equipment section, a 20 amp current limiter located on the current limiter panel, a RECOG LT Switch located on the Switch Panel and a RECOG LT circuit breaker located on the copilot circuit breaker panel. When the RECOG LT Switch is set to ON, 28 vdc is applied through the 7.5 amp RECOG LT circuit breaker to the control relay. With the control relay energized, 28 vdc is applied through the 20 amp current limiter to the recognition light. On Aircraft 25-138 and Subsequent, the lamp is a 600-watt lamp and is powered through a 30 ampere current limiter.

2. Removal/Installation
 A. Remove Recognition Light (See figure 202)
 (1) Remove attaching parts and tip tank nose cone.
 (2) Loosen and remove retainer.
 (3) Disconnect electrical wiring from bulb and remove bulb from tip tank.
 B. Install Recognition Light (See figure 202)
 (1) Connect electrical wiring to new bulb.
 (2) Install bulb and secure with retainer.
 (3) Install nose cone and secure with attaching parts.



Recognition Light Electrical Control Schematic
Figure 201

EFFECTIVITY: OPTIONAL (25-090 AND SUBSEQUENT)



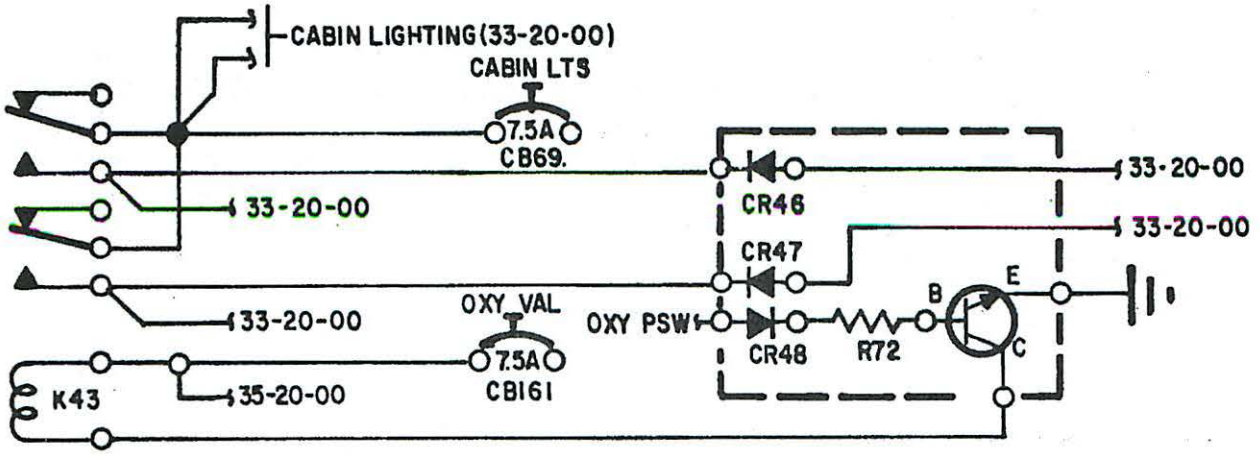
Recognition Light Installation
Figure 202

EMERGENCY LIGHTING - DESCRIPTION AND OPERATION

1. General
 A. On Aircraft 25-090, 25-094 and Subsequent, emergency cabin lighting is provided by utilizing the upper center panel lights and the oxygen aneroid switch.
 B. An optional Emergency Exit and wing ice inspection lighting system may be installed to provide emergency lighting.

DEPRESSURIZATION LIGHTING - MAINTENANCE PRACTICES

1. General
 A. If a depressurization condition should occur the oxygen system aneroid switch completes a 28 vdc circuit to the depressurization relay control circuit. A transistor within the control circuit is allowed to conduct and completes a ground circuit to the depressurization relay. With the relay energized, a ground circuit is completed to the cold cathode inverter. The remaining set of contacts in the depressurization relay complete a 28 vdc circuit and light the upper center panel lights.
 B. Maintenance practices consist of a functional test of the oxygen system (35-00-00), a wiring check and replacement of PCB124 circuit board and depressurization relay.
 C. The circuit board and relay are located on LH side of frame 9, between stringers 12 and 13.

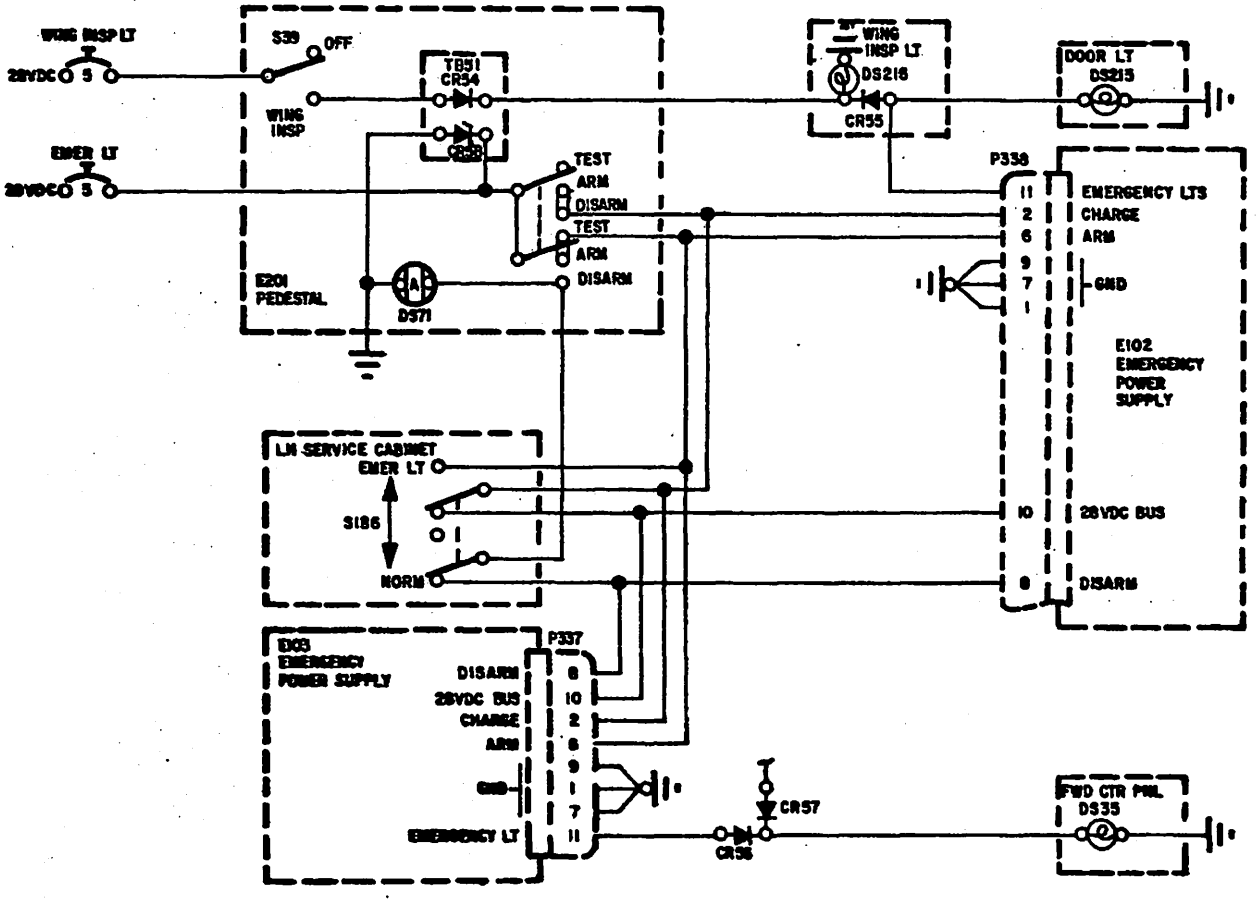


Depressurization Lighting Electrical Control Schematic
Figure 1

EMERGENCY EXIT AND WING INSPECTION LIGHTING SYSTEM - DESCRIPTION AND OPERATION

1. General
 A. The aircraft is equipped with two emergency exit and wing inspection power supplies. Each power supply consists of two sealed nickel-cadmium batteries and a control circuit module.
 B. One power supply is installed in the LH service cabinet. The second power supply is located on the cabin floor beneath the divan seat.
 C. The wing inspection light is installed on the RH side of the aircraft, adjacent to the lower forward corner of the emergency exit window.
 D. The emergency exit light is installed in the upper cabin door. The light illuminates the lower cabin door and the immediate area around the door.
 E. The cold cathode lights on the RH side of the upper center panel and the optional forward LH & RH upper center panel lights are powered by the emergency battery.

2. Operation
 A. During normal operation the emergency light DISARM-ARM-TEST Switch is set to ARM and the EMER LT-NORM light switch is set to NORM. This applies 28 vdc to pins 2, 6 and 10 of each power supply. This maintains the power supply control circuit in a standby state and provides a trickle charge to the nickel-cadmium batteries. Upon loss of power at pin 10, either by loss of aircraft power; EMER LT-NORM Switch set to EMER LT or emergency light DISARM-ARM-TEST Switch set to the test position, the control circuit completes a power circuit between the batteries and pin 11. This applies power for the interior lights, the emergency exit light and the wing ice inspection light.
 B. The wing ice inspection light is normally powered by a 5-ampere circuit breaker.
 C. The cockpit emergency battery (E103) provides power to light the interior cabin lights. The baggage compartment emergency battery (E102) provides power to light the wing ice inspection light and the emergency exit light in the upper cabin door.



Emergency Exit and Wing Inspection Light Electrical Schematic
Figure 1

EMERGENCY LIGHT AND POWER SUPPLIES - MAINTENANCE PRACTICES

1. General
 A. Maintenance practices consist of a functional test of the system and a discharge and recharge reconditioning cycle of the batteries.
 B. Maintenance practices for the emergency lights consist mainly of replacement of defective light bulbs. The emergency exit light replacement bulb is a GE 305. The wing ice inspection light replacement bulb is a GE 1683.

2. Removal/Installation
 A. Remove Cockpit Emergency Power Supply
 (1) Disconnect electrical plug from emergency power supply.
 (2) Remove attaching parts and power supply from aircraft.
 B. Install Cockpit Emergency Power Supply
 (1) Install power supply and secure with attaching parts.
 (2) Connect electrical plug from emergency power supply.
 C. Remove Baggage Compartment Emergency Power Supply
 (1) Remove cover assembly from LH side of baggage compartment liner.

 NOTE: The cover assembly is held in place by Velcro fasteners.

 (2) Disconnect electrical plug from emergency power supply.
 (3) Remove attaching parts and power supply from aircraft.
 D. Install Baggage Compartment Emergency Power Supply
 (1) Install power supply and secure with attaching parts.
 (2) Connect electrical plug to power supply.
 (3) Install cover assembly on baggage compartment liner.

3. Inspection/Check
 A. Perform Operational Check of Emergency Exit and Wing Ice Inspection Light Power Supply System
 (1) Connect external power source to the aircraft.
 (2) Set Battery Switches to BAT 1 and BAT 2.
 (3) Assure that all interior cabin lighting is switched off.
 (4) Set the Emergency Light DISARM-ARM-TEST Switch to ARM and the Cabin Emergency Light EMER LT-NORM Switch to NORM.
 (5) Set the Wing Inspection ON-OFF Switch to ON. Check that the wing ice inspection light is illuminated.
 (6) Set the Wing Inspection ON-OFF Switch to OFF. Check that the wing ice inspection light goes out.
 (7) Set the Emer Light DISARM-ARM-TEST Switch to TEST. The wing ice inspection, door emergency exit and the LH side upper

center panel lights should illuminate.

(8) Set the Emer Light DISARM-ARM-TEST Switch to ARM. The lights referenced in step (7) will go out.

CAUTION: DO NOT LEAVE THE EMERGENCY LIGHTING POWER SUPPLIES TURNED ON FOR ANY LONGER THAN NECESSARY TO CHECK THEIR OPERATION. THEY WILL BECOME DISCHARGED AFTER APPROXIMATELY TEN MINUTES OF EMERGENCY LIGHT OPERATION.

(9) Set the EMER LT-NORM light Switch to EMER LT. The wing ice inspection, door emergency exit and the LH side upper center panel lights should illuminate.

(10) Set the EMER LT-NORM light Switch to NORM. The light referenced in step (9) will go out.

(11) Set the Battery Switches to OFF. The lights referenced in (9) will illuminate.

(12) Set the Battery Switches to BAT 1 and BAT 2. The lights will go out.

(13) Set the Emer Light DISARM-ARM-TEST Switch to DISARM. Check that amber light adjacent to Switch is illuminated.

(14) Set the Battery Switches to OFF. Check that the amber light goes out and the lights in step (9) do not illuminate.

(15) Disconnect external power source.